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DRAFT
Cooling for SiDet Electrical Testing of L0

Items to Note About the Cooling System

I. The coolant in the chiller is 30% ethylene glycol by weight in distilled water. The freezing point is about 6°F (-14.5°C).

II. The minimum allowable coolant temperature is 14°F (-10°C). Coolant temperature during the test of A-layer modules is to be 68°F to 72°F. During later testing of the completed L0, coolant temperature may be lowered to 14°F (-10°C) to verify integrity of the structure at lower temperature. At that temperature, enough margin should remain between coolant and evaporator temperatures to prevent ice from accumulating within the evaporator.

III. Valves enabling flow through a bypass line at the valve panel within the Lab C clean north room must be open in order to control supply and return pressures to L0. We will ensure by administrative control that the valves will remain open. Labels will be affixed to the valves directing that the valves not be closed.

IV. Nominal total flow to and from L0 is 0.45 lpm. A flow switch in the return line from L0 removes power to the chiller pump and compressor if flow is less than 0.2 lpm.

V. A vacuum pump ensures that pressure at L0 is sub-atmospheric. A pressure switch in the manifold of the supply line to L0 removes chiller power if pressure is greater than +1 psig. The design of the vacuum pump ensures that the pump cannot lower pressure below 15" Hg.

VI. More extensive documentation will be provided before the chiller system is operated below room temperature. Such operation is not necessary for testing of the A-layer of L0.

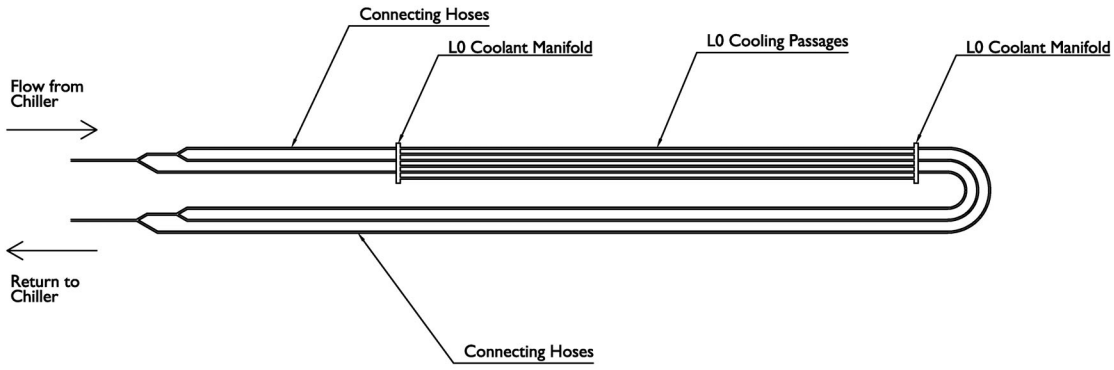
L0 Features

VI. Six PEEK cooling passages are imbedded within the L0 carbon fiber support structure. Each passage has a cross-sectional area corresponding to a diameter slightly less than 3 mm.

VII. Distribution manifolds at each end of the L0 support structure and integral with the structure connect the six passages to three nozzles to which external connections are made.

VIII. For the SiDet testing, connections from the nozzles to the chiller system are made with 1/8" ID x 1/16" wall Cilran tubing. Hose size is increased to 3/16" ID x 1/16" wall for the main hose run. Y's combine each set of three 3/16" ID hoses into a single hose.

IX. Figure 1 shows a sketch of the connections to the L0 structure.



Chiller and Cooling System

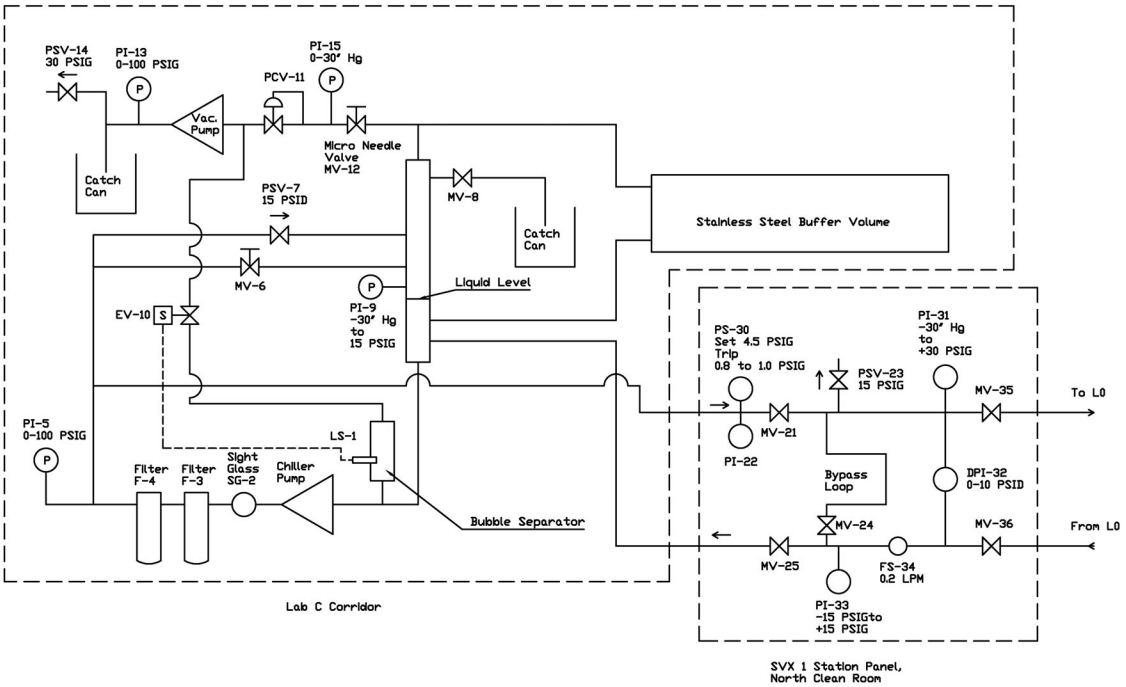
Flow for the test is provided by an existing chiller system which had been used for CDF Run IIa silicon. The chiller is VWR Scientific Model 1179P/SS, serial number 904073. We hope to receive documentation from CDF, but note that on June 27, 2005, the VWR Scientific web page showed the following specifications for model 1179PD, VWR catalogue number 13271-220 chiller:

Compressor:	1 HP
Cooling capacity:	
20°C:	2850 W
10°C:	1925 W
0°C:	940 W
Temperature range:	-15 to +40 °C
Pressure:	20 to 100 psi
Flow rate:	4 GPM

Electrical: 208/230V, 60 Hz, 11 A

The information on the VWR Scientific web page has changed in the last day. In today's listing, temperature range and pressure are no longer given, flow has changed to 3.5 GPM, and current has increased to 12.2 A. The label on the chiller itself specifies a current of 11 A, which agrees with yesterday's listing.

A flow schematic of the system is shown in Figure 2.



The majority of the chiller flow is bypassed through valves MV-6 and MV-24. Testing with cooling hoses having the same geometry of those of L0 indicates that, at room temperature, the desired flow to L0 should be obtained with valve MV-24 fully open and a differential pressure indicated by DPI-32 of 5.6 PSI. MV-6, PCV-11, and MV-12 are adjusted to obtain a reading of 11" Hg from PI-9. PI-31 should indicate -3" Hg.

Operating Procedures

Start-up:

1. Ensure that MV-35 and MV-36 are closed. Micro-switches on these valves bypass FS-34 if both valves are closed, thereby allowing the system to be started.
2. Ensure that the vacuum pump is on.
3. Ensure that the main chiller switch (on the back of the chiller) is on.
4. Examine the system for irregularities.
5. In the Lab C north clean room, press the "ON" button of the chiller control panel.
6. The chiller should start. Verify that the temperature set point at the chiller control panel is 21^{o}C. If necessary, set it to that temperature.
7. Verify that readings of PI-9, PI-31, and PI-32 are correct.

8. Wait until flow has been established and bubbles have cleared from the system.

Enabling flow to L0:

9. Inspect L0 and ensure that all cooling lines to and from it are intact and connected.
10. A normally open, momentary contact, push-button switch bypasses FS-34.
11. While holding the switch in, slowly open MV-36, then slowly open MV-35.
12. Check L0 hoses and connections for leaks.

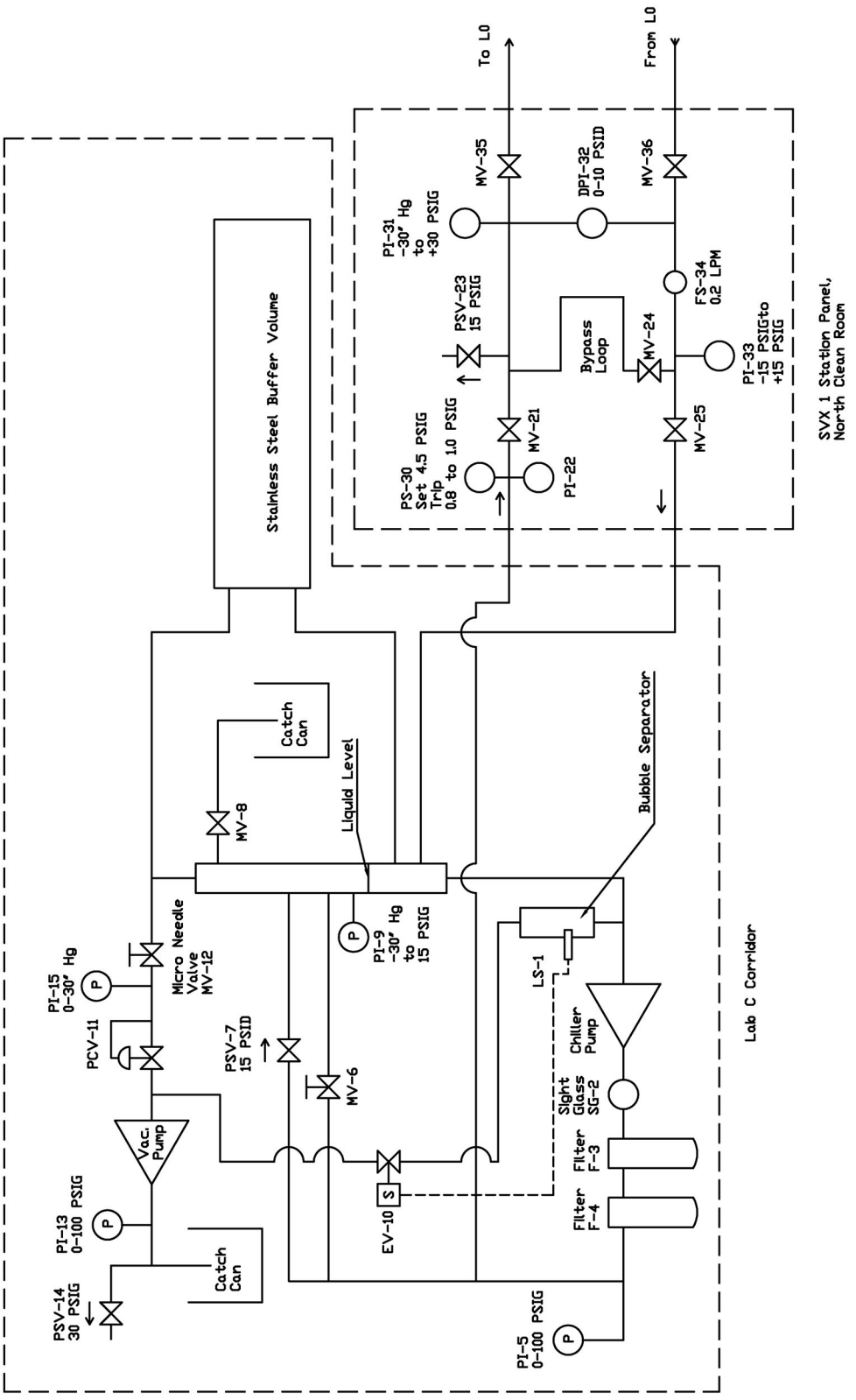
Shut-down:

13. Close MV-35.
14. Press the “OFF” button of the chiller control panel.
15. The chiller should shut off.
16. Leave MV-35 closed until temperatures and pressures have equalized, and then close MV-35.

Disconnecting L0:

17. Ensure that the chiller is off.
18. Pinch off the hose coming from MV-36 close to the valve, disconnect the hose, and place the hose end into a container suitable for the storage of ethylene glycol – water mixtures.
19. Pinch off the hose coming from MV-35 close to the valve, disconnect the hose, and fasten it high enough to ensure that L0 drains.
20. Once L0 has drained, air with a pressure not to exceed 3 PSIG may be used to purge and dry L0 lines and cooling passages.

A larger copy of the chiller system flow schematic follows.


To L0
From L0
MV-35
DPI-32
0-10 PSID
MV-36
PI-31
-30" Hg
to
+30 PSIG
PSV-23
15 PSIG
Bypass
Loop
MV-24
FS-34
0.2 LPM
PI-33
-15 PSIGto
+15 PSIG
PS-30
Set 4.5 PSIG
Trip
0.8 to 1.0 PSIG
MV-21
PI-22
MV-25
SVX 1 Station Panel,
North Clean Room
Stainless Steel Buffer Volume
Catch
Can
MV-8
Liquid Level
Bubble Separator
PI-9
-30" Hg
to
15 PSIG
LS-1
Micro Needle
Valve
MV-12
PI-15
0-30" Hg
PCV-11
PSV-7
15 PSID
MV-6
Chiller
Pump
Sight
Glass
SG-2
Vac.
Pump
Filter
F-3
Filter
F-4
EV-10
PI-13
0-100 PSIG
Catch
Can
PSV-14
30 PSIG
PI-5
0-100 PSIG
Lab C Corridor